REMARKS

I. FORM PTO 892 – Missing Reference

The body of the Office Action cites Kai-Kit Wong, A Joint-Channel Diagonalization for Multiuser MIMO Antenna Systems, IEEE Trans. on Wireless Comm., Vol. 2, No. 4 (July 2003), but this reference is not listed on the Examiner's Form PTO 892 as being considered.

Applicants respectfully request an updated Form PTO 892 listing this reference.

II. DRAWINGS

The drawings were objected to, but the Office Action did not specify the precise nature of the objection or the particular sheets to which the objection is applied. However, Applicants assume the objection was based on the French text appearing in Fig. 1, and the French acronyms "TEB" (corresponding to English "BER" for "bit-error-rate") in Figs. 5 and 6.

In response to the objection to the drawings, Applicants submit the enclosed Replacement Sheets 1/5, 4/5 and 5/5 in which the French text has been replaced with English text. This amendment is supported by the original French text and the original specification. No new matter has been added.

III. SPECIFICATION

The specification was objected to in which the Office Action requested a substitute specification in proper idiomatic English.

Applicants respectfully request that the specification be replaced with the enclosed, clean "substitute specification". No new matter has been added. Applicants also enclose an annotated version that illustrates the marked changes from the immediate prior version.

The specification is amended as suggested in the Office Action. If further objections are made, Applicants respectfully request that the objections be made more specific so that Applicants can fully respond to the objection.

Also, page 7, lines 19-20 is amended to replace "divided" by "multiplied" to be consistent with the corresponding PCT application.

IV. CLAIM REJECTION UNDER §101

Claim 11 was rejected under 35 U.S.C. §101 as being directed to allegedly unpatentable subject matter.

While Applicants respectfully disagree, claim 11 is cancelled, with traverse. Applicant reserves the right to pursue claim 11 in a continuation application, if desired.

V. CLAIM REJECTIONS UNDER §102(b)

Claims 1 and 9 were rejected under §102(b) as being allegedly anticipated by the Maryline Helard et al. publication.

A. Helard document

Helard discloses a transmission system that combines a linear precoding and Alamouti type space-time bloc codes.

Helard is not pertinent with regards to claims 1 and 9 since it does not disclose the idea of associating to each transmit antennas, a sub-matrix obtained by subdividing a unitary square matrix.

According to claim 1, for example, each antenna transmits a "resulting sub-vector", corresponding to the multiplication of a sub-vector (stemming from the division of a vector comprising N symbols to be sent), by the sub-matrix associated to this transmit antenna.

These features appear clearly in amended claim 1, which is new and non-obvious.

VI. CLAIM REJECTIONS UNDER §103(a)

Claims 1-3 and 9-10 were rejected as being allegedly unpatentable over Ahn et al. U.S. Publ. 2006/0291374A1 in view of Hochwald et al. U.S. Pat. No. 6,363,121.

Claims 4-8 were rejected as being allegedly unpatentable over Ahn et al. and Hochwald et al. in view of Boariu U.S. Patent No. 6,865,237.

Claims 1 and 9 were rejected as being allegedly unpatentable over Ahn et al. U.S. Publ. 2006/0291374A1 in view of the Kai-Kit Wong et al. publication.

A. Ahn document

Ahn discloses a modulation/demodulation method, which implements a diagonal matrix presenting coefficients equal "0" to elsewhere other than on its diagonal. This way, when an

antenna transmits a signal, the other transmitter antennas don't transmit anything (the transmission power is 0).

Ahn is not pertinent with regards to the present claims. Indeed, it does not propose to multiply each sub-vector by a distinct sub-matrix, the group of sub-matrices being obtained by subdividing a unitary square matrix.

Consequently, Ahn does not disclose either the fact that each antenna transmits a "resulting sub-vector", corresponding to the multiplication of a sub-vector stemming from a division of a vector comprising *N* symbols to be sent, by the sub-matrix associated to this transmit antenna.

B. Hochwald document

Hochwald describes a method for creating a constellation of signal matrices for wireless communication, enabling to deliver a signal in the form of an initial matrix of complex numbers, orthogonal in lines and columns.

Once again, Hochwald is not relevant with regards to the present claims.

According to this document, there is no subdivision of a unitary square matrix to obtain several sub-matrices.

According to Hochwald, the group of matrices is obtained by left-multiplying a (T,M) sized matrix representative of the signal, by a (T,T) sized matrix Θ, delivering a new (T,M) sized matrix, and repeating this multiplication operation on this new (T,M) sized matrix. This way, a set of (T,M) sized matrices L are obtained, whose columns are orthogonal.

Hochwald does not disclose that each antenna transmits a "resulting sub-vector" corresponding to the multiplication of a sub-vector stemming from a division of the vector comprising N symbols to be sent, by the sub-matrix associated to this transmit antenna obtained by the subdivision of a unitary square matrix.

C. Combination of Ahn and Hochwald documents

The combination Ahn and Hochwald is not pertinent with regards to the present claims.

None of these documents discloses the idea of subdividing a unitary square matrix into several sub-matrices, to associate a sub-matrix to each transmit antenna, and for each sub-vector

stemming from the division of the vector comprising *N* symbols to be sent, to multiply this sub-vector by one of the sub-matrices and to transmit the resulting sub-vector on the antenna associated to this sub-matrix.

D. Combination of Ahn, Hochwald and Boariu documents

Boariu concerns a space-time coding method, based on the use of Radon-Hurwitz type sub-matrices.

Boariu does not disclose the steps of claim 1 comprising multiplying each of the *Nt* sub-vectors by a distinct sub-matrix, and transmitting the resulting *Nt* sub-vectors by corresponding *Nt* transmitter antennas.

None of Ahn, Hochwald and Boariu alone, or in combination, discloses the features of amended claim 1.

Therefore, the combination of these documents does not challenge the validity of claims 4 to 8, dependant on claim 1.

E. Combination of Ahn and Wong documents

Wong concerns multi-user MIMO transmission systems. It discloses a linear pre-coding method enabling to consider a diagonal canal matrix.

Wong does not propose to subdivide a unitary square matrix to obtain a group of sub-matrices, and to affect a distinct sub-matrix to each transmitter antenna.

Thus, according to claim 1, and similarly claim 9, each antenna transmits a "resulting sub-vector" corresponding to the multiplication of a sub-vector (stemming from the division of the vector comprising *N* symbols to be sent), by the sub-matrix associated to this transmit antenna (obtained by subdividing a unitary square matrix).

The technique works this way regardless of the channel characteristics, that is, even if the channel is non-stationary, contrarily to Wong which needs a stationary or quasi-stationary channel.

Therefore, Wong is not pertinent with regards to claims 1 or 9.

F. Conclusion

None of Ahn and Wong alone, or in combination, discloses the features of amended claim

1, and the idea of:

- subdividing a unitary square matrix into several sub-matrices,
- associating a sub-matrix to each transmit antenna and,
- for each sub-vector stemming from the division of the vector comprising N symbols to be sent, multiplying this sub-vector by one of the sub-matrices and transmitting the resulting sub-vector on the antenna associated to this sub-matrix.

Accordingly, all claim rejections based on the cited documents should be withdrawn.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

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